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## Temporal variation in groundwater quality in the Permian Basin of Texas, a region of increasing unconventional oil and gas development

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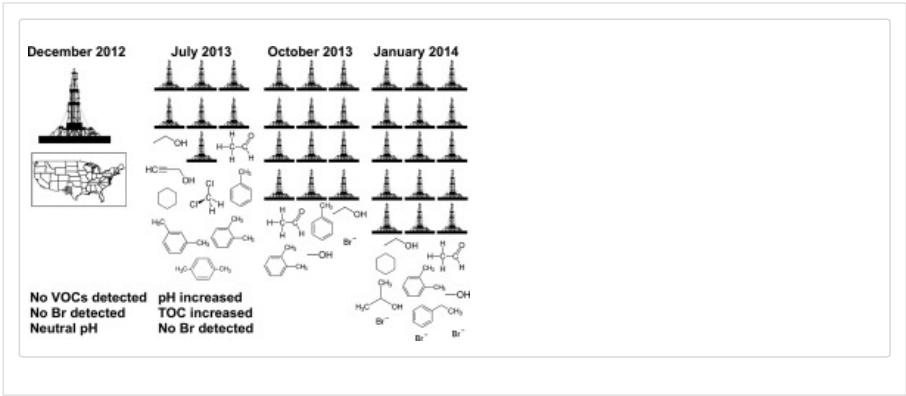
### Highlights

- Multiple samples of groundwater quality over time during expanding oil exploration
- Dramatic fluctuations in chemical detections and pH over time
- Bromide concentrations increased with expansion of drilling activity.
- These data provide insight into the life span of possible contamination events.

### Abstract

The recent expansion of natural gas and oil extraction using unconventional oil and gas development (UD) practices such as horizontal drilling and hydraulic fracturing has raised questions about the potential for environmental impacts. Prior research has focused on evaluations of air and water quality in particular regions without explicitly considering temporal variation; thus, little is known about the potential effects of UD activity on the environment over longer periods of time. Here, we present an assessment of private well water quality in an area of increasing UD activity over a period of 13 months. We analyzed samples from 42 private water wells located in three contiguous counties on the Eastern Shelf of the Permian Basin in Texas. This area has experienced a rise in UD activity in the last few years, and we analyzed samples in four separate time points to assess variation in groundwater quality over time as UD activities increased. We monitored general water quality parameters as well as several compounds used in UD activities. We found that some constituents remained stable over time, but others experienced significant variation over the period of study. Notable findings include significant changes in total organic carbon and pH along with ephemeral detections of ethanol, bromide, and dichloromethane after the initial sampling phase. These data provide insight into the potentially transient nature of compounds associated with groundwater contamination in areas experiencing UD activity.

### Graphical abstract



Keywords

Unconventional oil and gas development; Groundwater; Permian Basin; Shale energy

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